## Linac RF Overhead Budget

| Mechanism | | description | | Overhead needed (%) for maximum loaded cavity (383 kW beam power) | | |
|---|---|---|---|---|---|---|
| cavity | Lorentz force detuning | ~400 Hz | | for 100 Hz | 8.4% | for detuned cavity |
| | microphonics | +/- 100 Hz (6 sigma) | | for 200 Hz | **12.0%** | Qex ref's are used |
| | frequency setting error (control) | 10 Hz | | for 300 Hz | **18.3%** | Qex=7.3e5, 7e5 (med, high) |
| | Tunner resolution and backlash | 60 Hz | | for 400 Hz | 27.2% | ie, 7 % budget included |
| | mismatching with fundamental power coupler | Qex ref +/- 20 % | | for Qref | 7.0% | |
| | | | | for Qref +20 % | 2.9% | |
| | | | | for Qref -20 % | **14.4%** | |
| | | | | | | |
| Rf part | Transmission loss | 12 W/ft | | | 2.0% | |
| | RF control error (including klystron) | +/-0.5 degree, +/-0.5 % | | | 1.0% | |
| | others (circulator attenuation, klystron margin) | | | 5 % (?) | | |
| | | | | | | |
| Missing cavity | missing cavity retuning | | | 1.5% | | |
| | | | | | | |
| Beam | energy jitter | | | <1 % | | |
| | phase jitter | | | <1 % | | |
| | | | | | | |
| Total | | | | 31~37 %?? | | |

this rf error budget is based on 27.5 MV/m (med), 35 MV/m (high) and Iavg=27 mA option

Major rf budget is related with Lorentz force detuning and reference Qex setting

Rf power needed is sensitive to the Qex value, high Qex--> rf power needed is high for same delta f

20000

Qex=

F

Qex=

F